Chapter 6
Developing Plans and Policies: Landscape-Based Land Use Planning

6.1 Introduction

This chapter presents approaches to developing plans and policies that incorporate the information collected during Step 1 of the four-step framework—the analysis of the landscape and its wetlands—as described in Chapter 5. Developing plans and policies is part of Step 2 in that framework (Figure 6-1). Plans and policies are enhanced by information generated in Step 1, which involves analyzing the landscape processes as well as wetland functions. The results of this landscape analysis are applied in Step 2 to identify solutions that reduce the risk from human activities on the landscape.

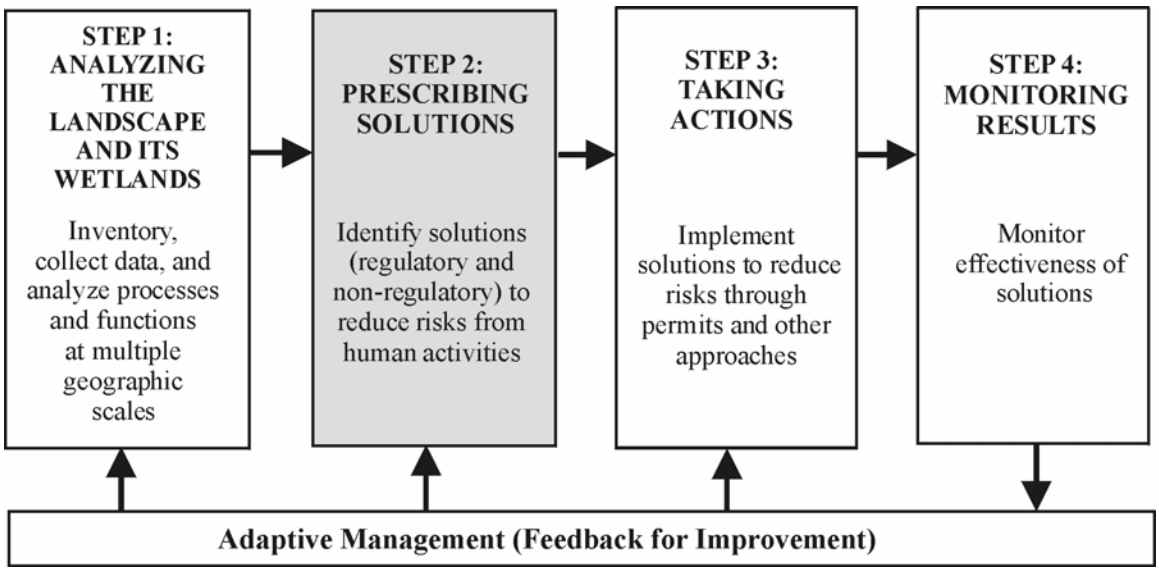

Figure 6-1. Developing plans and policies fits into Step 2 within the four-step framework recommended for protecting and managing wetlands.

This chapter begins with a brief overview of planning and the legal mandates of the Washington State Growth Management Act (Section 6.2). It then describes the importance of using a landscape perspective when planning (Section 6.3). Next, the concept of Smart Growth is introduced (Section 6.4); it is the umbrella for two complementary planning applications called Green Infrastructure and Alternative Futures, which are described in some detail. These approaches can be used as a foundation for the comprehensive planning process (described in Chapter 7). The chapter

concludes (Section 6.5) with a discussion of the fiscal benefits of protecting landscape processes and critical areas such as wetlands.

6.2 Overview of Planning and the GMA

Land use planning, in the context of resource management, is the formalized process by which jurisdictions identify what can or cannot occur on lands within their regulatory authority. In Washington State, land use planning is implemented at a local (county or city) level of government and is directed by the Growth Management Act (GMA), with state agency technical assistance and oversight.

In 1990 the Washington State Legislature passed the GMA (RCW 36.70A) to guide local jurisdictions in their land use planning efforts. The GMA dictates that counties and cities with certain characteristics must fully plan for future growth (RCW 36.70A.040). Chapter 2 of this volume provides an overview of the GMA, a review of Hearings Board and court cases relating to the GMA, and a discussion of critical areas and the use of best available science.

GMA identifies goals to be used by local governments to "guide" the development of comprehensive plans. A full range of actions is included, such as concentrating development to limit urban sprawl; coordinating transportation infrastructure; avoiding incompatible uses while maintaining the extraction of natural resources from forests and mines, and agricultural production on designated lands of long-term commercial significance; as well as a goal to protect the environment and the quality of life in the state. Cities and counties planning under GMA have responded to these mandates by developing or updating their comprehensive plans and the codes and ordinances that implement the plans.

The planning process should begin with understanding the landscape (as described in Chapter 5 and in the next section). Planning approaches and tools described in this chapter, such as Smart Growth, Green Infrastructure, and Alternative Futures, use landscape information to identify and incorporate different ways to minimize impacts and utilize the services (functions) provided by parts of the landscape such as wetlands, instead of building infrastructure to do so. These planning approaches also provide a way to incorporate community input into planning for future land use. These planning approaches can be used as a basis for revising comprehensive plans as well as other plans, regulations, and non-regulatory approaches. Good planning is therefore vital to the protection of critical areas such as wetlands.

6.3 The Importance of Incorporating a Landscape Perspective in Planning

Why is it important to incorporate a landscape approach in planning and to use planning approaches based on landscape information, thereby going beyond the comprehensive

planning process traditionally followed by many jurisdictions? Land use planning has traditionally focused on human-defined opportunities and constraints without always considering landscape processes. The synthesis of the research on wetland science and management (Volume 1) indicates that the current approach of "protecting wetlands" on a project-by-project basis does not protect or maintain the landscape processes that in turn affect the existence and functions of wetlands.

Cumulative effects on wetlands are one result of project-by-project decision-making and of regulatory programs that are inconsistent between jurisdictions. Multiple studies cited in Volume 1 found that project-based decision-making does not address cumulative effects (Johnston et al. 1990, U.S. Environmental Protection Agency 1999, Dale et al. 2000). This is especially significant for landscape processes that occur across jurisdictional boundaries (i.e., processes within the contributing landscape scale shown on Figure 4-2 in Chapter 4). Therefore, an analysis of the landscape should be reflected in the mandatory elements of comprehensive plans, policies, and regulations for a local jurisdiction.

Researchers recognize that planning at the landscape scale requires local jurisdictions to set management objectives and priorities that will dictate which resources will be most fully protected and which will be degraded or remain in a degraded condition. Chapter 7 of Volume 1 discusses literature that identifies the need for, and the challenges of, planning at the landscape scale for wetland management.

Despite these challenges, incorporating an analysis of the landscape into planning allows local governments to understand how landscape processes, and thereby the functions of wetlands, provide important services to communities such as improvements in water quality, reduced flooding, etc. With this knowledge comes the ability to modify and plan how we use the landscape to minimize impacts to those processes, functions, and resources. Minimizing the impacts of land use in turn prevents costly problems for communities associated with degradation of landscape processes. Using landscape analysis as a foundation for decision-making about land use is important for the maintenance of landscape processes over time: It therefore provides a fiscally responsible approach to sustaining development as well.

Local governments benefit from having an understanding of landscape processes and the functions of critical areas, where these processes and functions occur, the interaction between the landscape and critical areas, and how land uses may affect them. Such an understanding allows local governments to adopt appropriate land use zoning designations and make project permit decisions to maintain landscape processes and critical area functions. Science-based plans and regulations should also create a more efficient permitting process by reducing the need to complete complex environmental review and detailed studies at the permitting level.

Comprehensive planning based on landscape analysis, and thus grounded in the understanding of landscape processes and their interrelationships with wetlands, can also serve as the platform for integrating a broad array of protection measures such as critical areas ordinances, clearing and grading ordinances, zoning designations, Shoreline Master

Programs, and Endangered Species Act protections. Guiding policies and implementation tools can then reflect the provisions of the comprehensive plan to ensure long-term functions of wetlands through protection of landscape processes.

6.4 Smart Growth

The National Governors' Association promotes a concept and planning process called Smart Growth. Smart Growth can be defined as growth that protects open space, revitalizes neighborhoods, and makes housing more affordable while improving the quality of life in communities. Key to its definition are the concepts of:

- Fostering attractive communities with a strong sense of place,
- Preserving and restoring critical environmental areas,
- Reintegrating compatible uses in neighborhoods,
- Taking advantage of compact building design,
- Creating walkable neighborhoods, and
- Providing a variety of transportation choices.

Smart Growth is an alternative approach to managing growth that minimizes sprawl while maximizing landscape processes and is also fiscally beneficial. Smart Growth examines community development with the recognition that certain patterns of growth and decline are harmful to communities, undermining both their economies and the environment (Muro and Puentes 2004). In their paper *Investing in a Better Future: A Review of the Fiscal and Competitive Advantages of Smarter Growth Development Patterns,* Muro and Puentes (2004) review research on the effectiveness of Smart Growth. Their findings indicate that Smart Growth can reduce public costs of providing new infrastructure and delivering new services, improve a region's economic performance, and bring economic gains to suburbs as well as cities. (See Appendix 6-A for additional references and web pages about Smart Growth.)

Implementing this approach to managing growth places an emphasis on minimizing impacts to landscapes through application of two planning approaches associated with Smart Growth: "Green Infrastructure plans" and analysis of "Alternative Futures." Both of these very similar yet complementary approaches examine how the services and infrastructure provided by natural systems can be used to benefit communities and how these systems are best maintained into the future. These planning approaches can readily be used by local governments to determine the content of comprehensive plan elements, and they can help guide the structure of the implementing regulatory and non-regulatory programs.

By applying Smart Growth approaches, in conjunction with the landscape analysis, a local jurisdiction develops the most desired land use plan (i.e., the best greenprint or

alternative futures scenario). That desired or conceptual land use plan, often presented in the form of a map or maps, includes the location and type of all the open space areas desired for conservation, preservation, and restoration (including degraded open space that provides opportunities to restore processes and functions). It also includes transportation corridors and the desired land uses that will maintain and protect processes and functions. The implementation tools used to conserve, preserve, and restore the identified areas may be either regulatory or non-regulatory. Which protection measures work best at any location are determined by the functional attributes of the site, consideration of risk, and, ultimately, the desires of the community.

Land use policies under Smart Growth encourage mixed-use zoning, limited outward expansion, higher density development, reduced travel, revitalization of urban centers, and preservation of open space essential to maintaining critical areas and landscape processes. Regulatory development standards focus on low impact development (LID) practices, such as reduction in road widths and parking lot size, maintenance of tree cover, alternatives to impervious surfaces, compact building design, etc. Non-regulatory programs adopted using the Smart Growth approach emphasize preserving and restoring core greenspace areas. A local jurisdiction's effectiveness at preserving and restoring core greenspace areas is higher when both regulatory and non-regulatory tools are applied.

Smart Growth practices and the associated planning approaches can be applied at any time in the local planning review process. Whenever a local jurisdiction intends to update its comprehensive plan and implementing ordinances, or develop new subarea plans, it is an appropriate time to incorporate the landscape analysis and use Smart Growth principles. Implementing these analysis tools early in the process will result in greater benefit in terms of maintaining the services and infrastructure provided by the landscape and providing more livable and affordable communities.

A case study of Smart Growth benefits

A recent study by Preuss and Vemuri (2004) projected the effectiveness of Smart Growth practices implemented in Montgomery County, Maryland, in the 1960s. At that time Montgomery County implemented Smart Growth tools including transfer of development rights, cluster development, and open space acquisition into their land use planning practices.

Preuss et al. applied a dynamic model to predict future implications of Montgomery County's past growth management actions by reviewing three different scenarios: (1) traditional policies, (2) environmentally friendly or current Smart Growth, and (3) full development. They found that Montgomery's current Smart Growth practices reduced negative effects on water quality and preserved more open space than the other two scenarios. In addition, under Montgomery's existing Smart Growth practices, developable land would still remain into 2050 while being non-existent under the other scenarios.

6.4.1 Green Infrastructure Planning

Green infrastructure or GRIST is defined as an interconnected network of protected land and water that supports native species, maintains landscape processes, sustains air and water resources, and contributes to the physical and economic health and quality of life of communities. This network of lands includes a wide variety of both relatively undisturbed and restored ecosystems and landscape features that make up a system of hubs and links. The integrated network of hubs and links helps sustain landscape processes while also providing corridors for wildlife movement. (Conceptual illustrations of "hubs and links" are provided in Section 6.4.1.2, which discusses the typical steps in developing and implementing a GRIST plan.)

The resulting network of ecologically important lands integrates:

- Waterways, wetlands, forests, wildlife habitats, and other natural areas;
- Greenways, parks, and recreation lands;
- Working farms, ranches, and forests; and
- Wilderness and other open spaces that support native species and maintain landscape processes.

GRIST plans are an important element in the Smart Growth package because they help local planners identify and prioritize resources to be preserved, ensure the economic viability of working landscapes, and orient development in a manner that is compatible with sustaining landscape processes and the character of the community. GRIST plans provide a "greenprint" (similar to a blueprint for transportation) for accommodating land

use patterns while preserving critical areas, native species, cultural assets, and natural resource lands.

The President's Council on Sustainable Development identified **green infrastructure** as a key strategy for achieving sustainability in the report *Towards a Sustainable America – Advancing Prosperity, Opportunity and a Healthy Environment for the 21st Century* (Williamson 2003.) Additional references on green infrastructure and Smart Growth topics are provided in Appendix 6-A.

6.4.1.1 The Greenprint Approach

When developing a GRIST plan (or "greenprint"), conservation of landscape processes and critical areas establishes the foundation on which the rest of the local comprehensive plan is built.

Integrating the results of landscape analysis (as described in Chapter 5) into the GRIST plan ensures that the functions and processes necessary to ensure long-term protection of wetlands and other resources are thoroughly understood and considered to avoid future impacts or loss. For example, areas where significant groundwater discharge/recharge and groundwater storage occur would not be appropriate to zone for uses that would result in a high percent of impervious surfaces (roofs, driveways, roadways, parking lots). These areas would be more appropriate to zone as open space or for other low-density uses, rather than being designated for high-density development. The local jurisdiction might want to consider preserving such areas from development altogether so that the community's water supply infrastructure is assured into perpetuity.

A GRIST plan can also identify areas that provide important landscape processes but that need restoration. For example, this might include areas where construction of levees has separated rivers from their floodplains, or where drainage channels are conveying subsurface waters away from wetlands.

Thus, integrating the results of the landscape analysis allows a jurisdiction to direct human activities to locations that avoid or minimize impacts to critical areas, sustaining them over time while supporting the community's needs for adequate water supplies, water quality, flood attenuation, etc.

Green infrastructure planning tracks the pace and location of land use in relationship to sustaining natural environments, critical areas, and the services they provide. By integrating the benefits of landscape processes and services, GRIST plans assess current conditions and guide future land uses in a manner similar to how a transportation plan provides a blueprint for existing and future travel needs.

Communities at any stage of planning or development can incorporate green infrastructure into their planning processes:

- **GRIST planning for areas with little urban development.** When applying the results of a landscape analysis through a GRIST plan for a jurisdiction (or portion

thereof) that has experienced little human development, a network of critical areas and resource lands can be identified for conservation. This network can be coordinated with plans for the built infrastructure such as essential transportation corridors. Essential green infrastructure can be preserved and/or restored while transportation corridors and built environments are accommodated. This clearly identifies where both public and private development will be better suited, thereby planning land uses that are compatible with the landscape.

- **GRIST planning for areas that are largely developed.** In jurisdictions where the landscapes have already been largely developed, applying the results of the landscape analysis through GRIST plans can designate and protect the remaining natural systems and linkages while considering the existing roads, urban centers, etc. The results of the landscape analysis also allow the jurisdiction to identify those portions of the landscape where essential processes and functions could be restored.

Implementing GRIST planning begins with incorporating the GRIST plan into the Land Use Element of the comprehensive plan (as well as the Shoreline Master Program). Other relevant elements of comprehensive plans should also include policies and directives for successfully implementing GRIST planning. The comprehensive plan elements are then followed with establishment of both regulatory and non-regulatory programs and tools.

Which tools are used, and where and how they are applied, will depend on the goals and needs of the GRIST plan in relation to landscape processes, their level of degradation, their sensitivity to disturbance, and development pressures. For example, in a particular subbasin it might be more critical to protect and maintain wetlands because the quality of the water is threatened by non-point pollution. Thus, policies in that basin may direct agricultural uses to provide limited access to aquatic resources and encourage restoration of aquatic habitats and their buffers, while zoning designations could reflect strict wetland protection standards. Policies and regulations may recommend low-impact development practices or even land acquisition as the preferred tool for protection of an undeveloped area that provides aquifer recharge.

6.4.1.2 Typical Steps in Developing and Implementing a GRIST Plan

While each local jurisdiction might need to develop a GRIST plan in its own way, there are some key steps that each should address (discussed below). Some of these steps may overlap with the landscape analysis discussed in Chapter 5. For detailed guidance on GRIST planning, please reference the four-volume workbook titled *Local Greenprinting for Growth* (Trust for Public Lands and National Association of County Officials 2002).

Step - Develop the Overall GRIST Approach and Define Its Geographic Scope

Developing an approach requires (1) defining the scope of the project, (2) establishing a means of engaging the community through education and public input and providing a forum for group decisions on the plan, and (3) understanding fiscal costs and benefits.

Decisions will need to be made regarding the geographic scope of the GRIST plan and the resources that will be examined. The geographic scope is the portion of the landscape under consideration: Is it at the scale of the contributing landscape involving several jurisdictions, or a management area such as a county, city, or subbasin? Defining what areas should be part of a greenprint should ideally be examined in light of the sensitivity of different areas identified during the landscape analysis.

GRIST planning is a process of community visioning and decision making; the community must be informed and engaged early in the process. Public understanding and involvement are essential to the success of the greenprint design. A communication plan should be created early in the process, identifying how the local community will be engaged, what committees will be used to make planning decisions, what will be their composition and decision-making power, etc.

The fiscal savings that accrue as a result of protecting landscape processes must be clearly articulated from the start. Some local jurisdictions conduct fiscal analyses comparing the cost of building infrastructure to the cost of protecting green infrastructure, including the revenue benefits that green infrastructure provides to communities. Other fiscal benefits worth considering are those enabled by the cultural amenities of attractive landscapes, which include greenspaces such as parks and recreation lands and open spaces provided by greenbelts and working farms; these values are increasingly important in attracting the creative workforce that can add economic growth potential to communities (Florida 2002). This is important information since the fiscal value of open space will need to be communicated to policy-makers as well as the community. (See Section 6.5 of this chapter for further discussion of fiscal benefits.)

Step 2 - Inventory Resources

Inventorying resources might consist of the landscape analysis discussed in Chapter 5 or another method that is appropriate to assess the characteristics of the green infrastructure in the planning area. Using a landscape analysis ensures an understanding of the relationship of landscape processes and wetland functions and how they have been altered. Landscape data can be used in conjunction with additional information such as other resource features, detailed ownership patterns, and current or projected zoning overlays. Together this information can assist with deciding how landscape processes and wetland functions should be protected and the type and location of preservation and restoration measures needed.

Figure 6-2 provides a simple, conceptual illustration of a landscape that has been inventoried as part of developing a GRIST plan. This graphic serves as the base for Figures 6-3 and 6-4 which illustrate subsequent steps in GRIST planning. Examples of

more detailed landscape analyses that have been completed by Ecology are provided in Appendix 5-C.

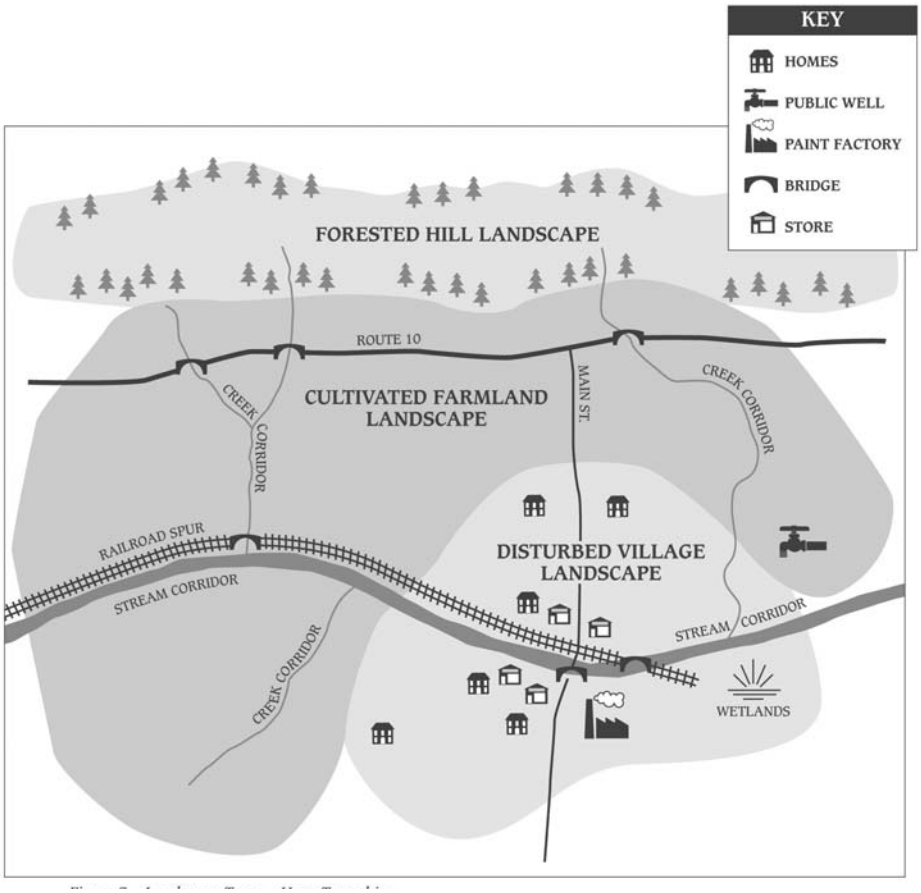

Figure 6-2. Conceptual representation of a landscape that has been inventoried as part of creating a GRIST plan. *(Figure provided by Heritage Conservancy, a non-profit land trust based in Doylestown, PA.)*

Step 3 - Envision the Future

Envisioning the future is when the community establishes overriding principles that guide the development of the GRIST plan. These are the goals for the greenprint and may include preserving critical areas within each landscape type, maintaining and/or restoring landscape processes that sustain the ecosystem, restoring lands, creating or enhancing open space corridors, and so on. The envisioning process of the GRIST plan also inherently needs to include discussion and identification of the least sensitive lands that are most appropriate for development for a range of uses that are prioritized by the community.

Step 4 - Finding the Hubs and Links

Finding the hubs and links requires a detailed examination of key ownership and land use patterns and defining how they will be addressed in the GRIST plan. After the landscape

analysis process, the identification of existing or potential hubs and links will become more readily apparent. For example, cultivated lands, forest cover, and existing preserves will be obvious "hub" points from which to examine retaining or recreating corridor "links" between the "hub" sites (see conceptual illustration in Figure 6-3). As this network is envisioned, steps to round out as well as implement the plan—such as purchasing parcels of land to connect habitat areas or restoring wetlands or riparian areas—will become apparent.

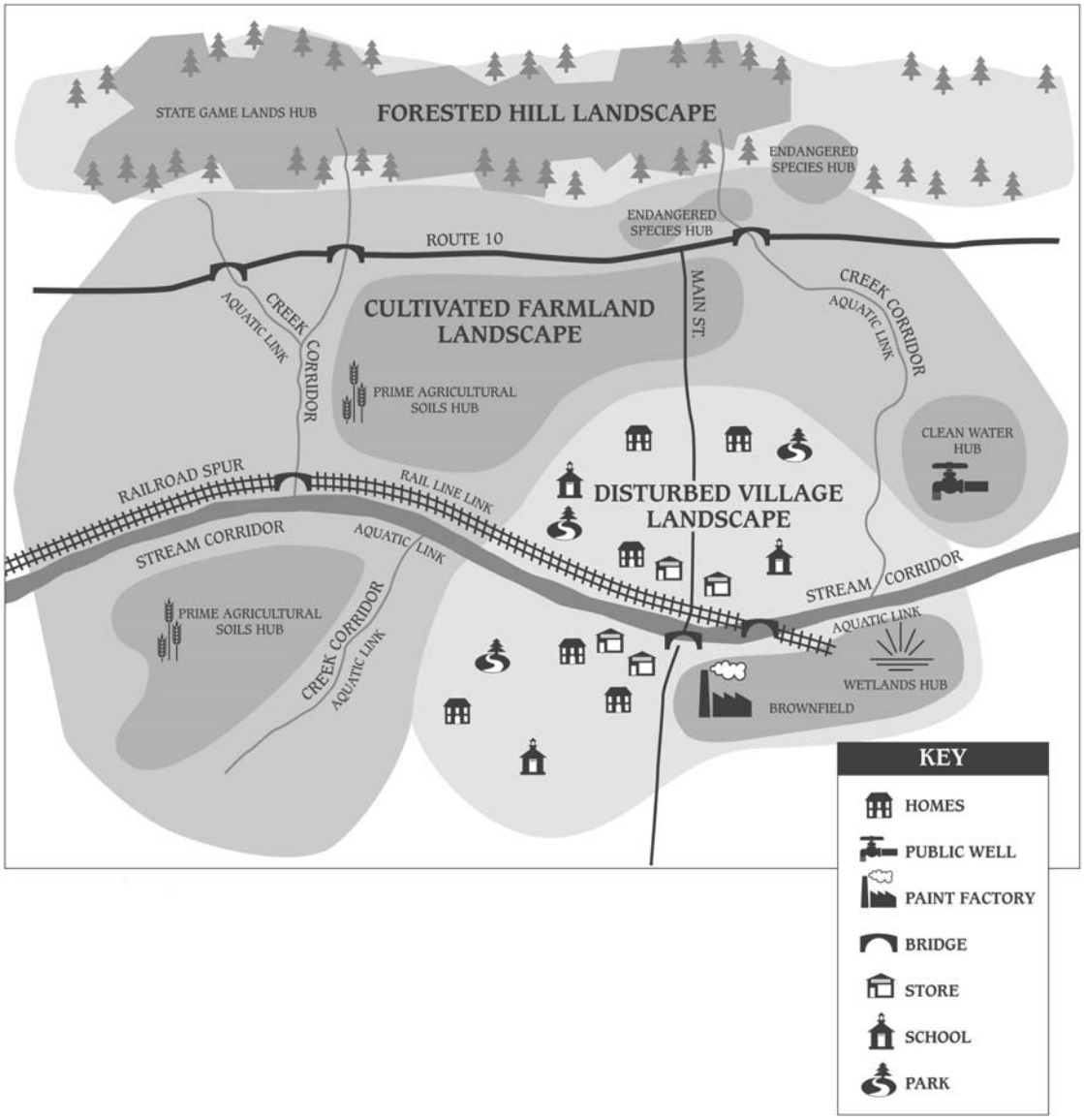

Figure 6-3. Conceptual representation of how hubs and links are identified as part of creating a GRIST plan. *(Figure provided by Heritage Conservancy, a non-profit land trust based in Doylestown, PA.)*

Defining what areas need to be part of the greenprint should be examined in light of the landscape processes identified during the landscape analysis. Areas that require

specialized protection because of their sensitivity can then be accommodated in the greenprint, whether by using regulatory provisions, preservation, or restoration actions.

Step 5 - Creating the GRIST Plan

Creating the GRIST plan involves using the data from the landscape analysis to guide the greenprint with its hubs and links as a base to design potential land use scenarios. Alternative scenarios can be examined using mapping and different policy and zoning applications. Then the community's goals for the future are applied, and the appropriate course of action can be identified.

This stage in GRIST planning focuses on what provisions are needed in various portions of the landscape to effectively protect, preserve, and restore core areas of concern. At this stage of the process, a clear understanding of the direction for further development of the comprehensive plan, implementing policies and regulations, and non-regulatory tools should be apparent. Figure 6-4 provides a conceptual illustration of a completed GRIST plan.

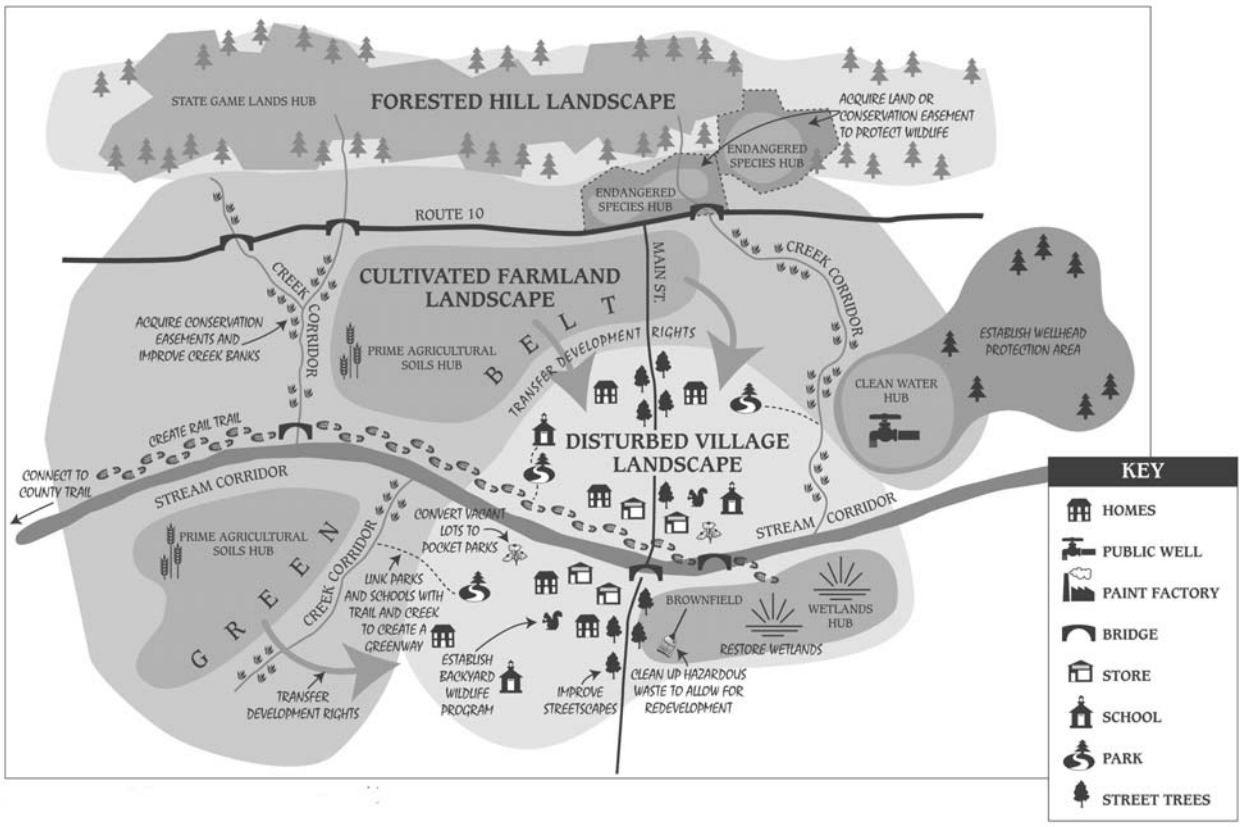

Figure 6-4. Conceptual representation of a completed GRIST plan. *(Figure provided by Heritage Conservancy, a non-profit land trust based in Doylestown, PA.)*

Step 6 - Implementing the GRIST Plan

Several means can be used to implement a GRIST plan, beginning with integrating it into the Land Use Element of the comprehensive plan. Comprehensive plan policies are followed by revised zoning designations, revised critical area or other regulations, and development of non-regulatory programs with landowner incentives, acquisition funding, and restoration programs.

6.4.2 Alternative Futures

Alternative Futures is another complementary planning approach that can be used as part of an overall Smart Growth effort. Alternative Futures is a process through which a community makes informed land use decisions based on different future scenarios for human activities and their effects on the environment. The approach consists of creating a series of scenarios that depict what the landscape might look like in the future with various options for land use in place. Each scenario is analyzed for its effect on water quality, water quantity, fish and wildlife habitat, or other landscape processes of concern to the community. The analysis also assesses the potential benefits and impacts of the scenarios. When the preferred option is selected, the result is a land use plan based on protection of natural resource lands and critical areas, and designed with the community's vision of future ecologically sustainable development in mind.

Community meetings are held to provide the public with maps showing examples of what their planning area will look like using the different scenarios. Instead of a political boundary, a watershed or other boundary based on the features of the landscape can be used to analyze the effects of land use changes on landscape processes. These maps compare the different scenarios using current policies and regulatory provisions, as well as alternatives that are both more and less stringent regarding protection of resources. Often, examining these scenarios helps the public to better understand what is at stake, thus helping communities shape informed goals and plans for their future. Alternative Futures analysis provides an outstanding tool for visually capturing the effects of land use policy decisions on the landscape, so that more informed choices can be made.

Like GRIST planning, Alternative Futures relies heavily on involving an interested and informed citizenry in the planning and design of a desired future. Again, a strong emphasis is placed on setting up the process such that communication, education, and participation are engaged early on.

A Local Example of Alternative Futures Planning

In January 2001, the Kitsap County Department of Natural Resources used the Alternative Futures process to examine different scenarios in the Chico Creek watershed for developing a subarea plan amendment to the County's comprehensive plan. The project was funded as a pilot project by the U.S. Environmental Protection Agency under a grant to the Puget Sound Action Team. The Chico Creek watershed drains 16.3 square miles of land west of Dyes Inlet in Kitsap County. Information regarding the details of the project can be found at: www.psat.wa.gov/programs/LID/LID_futures.htm.

The County found the Alternative Futures approach to be a unifying process that integrates land use planning with other regional processes such as watershed planning, salmon recovery, clean water plans, and other regulatory directives such as GMA. Using the Alternative Futures process, the county developed the preferred alternative by:

- Conducting a technical assessment of current conditions,
- Involving citizens and interested parties in developing and selecting scenarios,
- Testing the scenarios using GIS and scientific analyses, and
- Making an informed selection of the preferred scenario for future land use.

To accomplish these tasks they established assessment goals, analysis goals, and planning goals.

A strong component of Kitsap County's approach was public involvement. Five subcommittees were established, including an education work group, a public involvement work group, a technical work group, a restoration work group, and a watershed advisory committee. From these they constructed an effective education campaign and public involvement process.

Four scenarios were examined: (1) the current regulatory condition, (2) a strong development scenario, (3) a strong conservation scenario, and (4) a moderate scenario falling between development and conservation. A suite of analyses, using natural resource indicators, were conducted to identify the impacts of each alternative. The current regulatory condition scenario was dropped early on due to the severity of impact. The end result was selection of the "moderate" development scenario incorporating conservation practices.

Kitsap County officials were pleased with the benefits of the Chico Creek project and propose using the Alternative Futures approach to develop subarea plans for other watersheds throughout the county.

6.4.3 Combining Complementary Approaches

Each type of planning approach discussed here—landscape analysis, Green Infrastructure planning, and Alternative Futures—is complementary to the others. Applying the core elements of these three approaches in combination can offer a strong analytical package for making decisions regarding land use that will benefit the community and incorporate consideration of landscape processes.

Landscape analysis (described in Chapter 5) provides a strong foundation for Alternative Futures analysis because it highlights the essential landscape processes that should be considered prior to selecting a preferred scenario for future land use. Landscape analysis and Alternative Futures together provide a very useful tool for visually displaying the effects of land use decisions on the maintenance of landscape processes.

GRIST planning also assists with the Alternative Futures process by:

- Reinforcing the benefit of using the results of a landscape analysis as the basis for planning so that landscape processes can be sustained,
- Recognizing the role of landscape processes and wetland functions as "infrastructure" and therefore worthy of protection for fiscal reasons,
- Adding hubs and links as functionally important to the maintenance of landscape processes, and
- Integrating working landscapes (natural resources lands such as agricultural and forest lands) as valued green space.

Likewise, the application of Alternative Futures can be an integral part of creating a GRIST plan. Alternative Futures helps the GRIST process by applying "metrics" to quantify the impacts of disturbance on the landscape. Metrics are environmental indicators of stresses within an ecosystem. These metrics are usually selected based on a significant statistical correlation with environmental data (e.g., a correlation between impervious surface and species richness). The metric also undergoes a calibration process using environmental data within the watershed where it will be applied. Several metrics are typically used in order to improve the accuracy of the evaluation. The use of metrics is an important tool for evaluating alternative land use scenarios. Current research in the Puget Sound lowlands is building our understanding of key stresses that affect landscape processes. Calibration of various metrics such as impervious surfaces, road density, number of stream crossings, and riparian connectivity is currently being conducted by local researchers (for example: Alberti et al. 2003).

Checklist of factors to be considered in making land use decisions while looking toward the future

In the paper "Ecological Principles and Guidelines for Managing the Use of Land" by V.H. Dale et al. (2000), a collaboration of scientists from around the country provide a checklist of factors to be considered in making land use decisions while looking toward the future. These factors include: (1) examine the impacts of choices in a regional or landscape context, (2) plan for long-term change and unexpected events, (3) preserve rare landscape elements, critical habitats, and associated species, (4) avoid land uses that deplete natural resources over a broad area, (5) retain large contiguous or connected areas that contain critical habitats, (6) minimize the introduction and spread of non-native species, (7) avoid or compensate for the effects of development on ecological processes, and (8) implement land use and land management practices that are compatible with the natural potential of the area.

V.H. Dale et al. (2000) provide guidance for applying each of these factors to the planning process. They note that the mobility of human activities is more flexible (within limits) than the mobility of processes and resources that provide important landscape processes. Therefore, ecological constraints (the need to manage landscape processes for the long term) can be used as the primary consideration in land use planning. The planning sequence they suggest is to first plan for maintaining water and biodiversity; then for cultivation, grazing, and the harvesting of wood products; then for managing sewage and other wastes; and finally for the placement of homes and industry. (Note: These goals are also listed in Chapter 1 and should be considered throughout the four-step framework for protecting and managing wetlands and other critical areas.)

6.5 Fiscal Savings and Other Benefits

Protection of landscape processes and wetland functions can provide important fiscal savings as well as other benefits. Many people assume that revenue will be lost as a result of land protection, while the costs of constructing infrastructure to provide necessary services once green space is gone and landscape processes are degraded are often overlooked.

Several recent papers have documented the costs associated with losing systems that provide landscape processes and wetland functions. In *Taking its Toll: The Hidden Costs of Sprawl in Washington State*, Mazza and Fodor (1999) point to water quality and quantity impacts, smog and health issues, habitat and species losses, overall watershed decline, and general quality of life concerns. All of these losses can affect the economic viability of communities.

A report by the Trust for Public Land and The National Association of County Officials (2002) presents the numerous benefits of recognizing that certain lands are necessities, not just amenities:

- Fiscal savings, which are demonstrated when purchased open space more than pays for itself,
- Economic benefits, when the quality of life improvements attract business investment,
- Free infrastructure, as green space provides services that avoid the expense of building infrastructure, thus saving taxpayer money,
- Environmental benefits, through linking land use planning to the protection of landscape processes and ecosystem biodiversity, and
- Health and social amenities, such as recreation opportunities that are constructive alternatives to deter adolescent antisocial behavior while contributing to the health and wellness of communities.

The following paragraphs discuss and provide examples of four general types of fiscal savings resulting from protection of landscape processes.

Use of Green Infrastructure Instead of Building Infrastructure

As demonstrated in the examples that follow, communities around the country that conduct a fiscal analysis of their revenues versus expenditures are finding that conservation of green infrastructure saves money in the long term. Purchasing and preserving land results in cost savings by avoiding the need to build infrastructure later. The green spaces also improve quality of life for citizens and add economic vitality to communities.

When New York City was faced with the need to spend $8 billion on new water filtration and treatment plants, they instead purchased 80,000 acres of watershed land in the Catskill Mountains for $1.5 billion. The land functions to filter and purify drinking water. The land purchase saved the city $6.5 billion by not building a treatment plant and another $300 million a year in forgone costs of operating the plant.

In the 7-million-acre Willamette/Lower Columbia region of the Pacific Northwest, the tree canopy has been reduced from 46 to 24% between 1972 and 2000 due to the expansion of roads, buildings, and pavement in general. This significant canopy loss in 28 years has imposed $2.4 billion in costs for managing the increased stormwater runoff, according to a Regional Ecosystem Analysis by American Forests (2001). Each year this lost canopy of trees would have also absorbed 138 million pounds of pollutants and saved $322 million in related cleanup costs. According to the study, the region's remaining trees are still detaining and purifying a massive quantity of stormwater that would have otherwise required construction of a $20.2 billion treatment plant to manage runoff. The trees also absorb 178 million pounds of pollutants annually, whose potential cleanup would cost $419 million a year.

Increase in Local Tax Base

Protecting areas that provide landscape processes, including retaining green spaces and wetlands, improves the quality of life. Quality of life is a determining factor in real estate values and economic vitality. The green spaces of Portland, Oregon, for example, have helped build this city's reputation as one of the country's most livable cities. "The real estate market consistently demonstrates that many people are willing to pay a larger amount for property located close to parks and open space areas than for a home that does not offer this amenity," writes John L. Crompton, a professor at Texas A&M University (Sherer 2003.) A study in Portland found that residential property values increased if they were in closer proximity to a wetland, increasing by $436 for every 1,000 feet (Barclay and Batker 2004.) The higher value of these homes means that their owners are paying higher property taxes. In some instances, the additional property taxes are sufficient to pay the annual charges on bonds used to finance the acquisition and development of a park.

This has also been demonstrated in a study examining residential proximity to greenbelts conducted in Boulder, Colorado. Here the average values of homes next to the greenbelt

were 32% higher than those just 3,200 feet away. The study showed that the greenbelt added $5.4 million to the total property values of one neighborhood, generating $500,000 per year in additional property taxes. This was enough to cover the $1.5 million purchase price of the greenbelt in only 3 years (Sherer 2003.)

It is also important to note that value is not fixed in time: The values of many ecological services are growing as they become increasingly scarce. Barclay and Batker (2004) note that environmental quality today plays a pivotal role in the ability of a region to attract workers and new firms. A community with a degraded environment is more likely to suffer economically (Barclay and Batker 2004.)

Costs of Building in the "Wrong Place"

The town of Pittsford, New York, commissioned a fiscal model from Behan Planning Associates to determine the costs of expanded urban development versus the costs of land protection. The fiscal model could predict future tax rates based upon the costs and revenues associated with future land use patterns. The model estimated that land purchases under a greenprint plan would cost the average taxpayer $1,400 more in property and school taxes over 20 years, whereas the cost to fully develop the land under their existing policies would cost $5,000 more. This analysis revealed that it would be much less expensive to implement the greenprint plan than allow development in the wrong locations (Trust for Public Land and National Association of County Officials 2002).

Costs of Providing Services

A study by the American Farmland Trust (cited in Mazza and Fodor 1999) showed that for every $1 generated in tax revenue, the median cost to provide services to residential areas was $1.15, while only $0.37 was spent on agricultural or natural resource lands. A study in Washington showed that the added expense for off-site facilities serving a typical new home is $20,000 to $30,000, which does not match the tax revenue generated to cover these costs (Mazza and Fodor 1999). Additional information on this topic can be found in a paper on the *Three Myths of Growth* (Fodor 1996), which addresses the belief that growth builds a tax base that provides enough revenues to cover the necessary services.

Additional Resources

Many resources are available for local governments that wish to pursue Smart Growth, Green Infrastructure, Alternative Futures, and associated concepts discussed in this chapter. Published and online resources for further information are listed in Appendix 6-A.